UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
PSC Box 20041
Camp Lejeune, North Carolina 28542-0041

LVSM 7208

STUDENT OUTLINE

MAINTAIN THE LVS COMPRESSED AIR BRAKE SYSTEM

LEARNING OBJECTIVES

1. Terminal Learning Objective: Given an LVS, TM 2320-20/12A, tools, and equipment, perform second echelon maintenance on the LVS compressed air brake system, per the reference. (3521.13.19)

2. Enabling Learning Objectives:

a. Given an LVS, TM 2320-20/12A, tools, and equipment, test the LVS brake system, per the reference. (3521.13.19a)

b. Given TM 2320-20/12A and partial statements pertaining to the LVS compressed air brake system, complete the partial statements to describe the procedures used to diagnose a malfunctioning brake system, per the reference. (3521.13.19b)

c. Given an LVS, TM 2320-20/12A, tools, and equipment, adjust the LVS brake system, per the reference. (3521.13.19c)

d. Given an LVS, TM 2320-20/12A, tools, and equipment, repair the LVS brake system, per the reference. (3521.13.19d)

1. IDENTIFICATION, LOCATION AND FUNCTION OF THE COMPONENTS EMPLOYED IN THE LVS COMPRESSED AIR SYSTEM

a. The Compressed Air System. The LVS compressed air system is actually four subsystems. These subsystems may use the same components. These subsystems are: air supply, primary, secondary, and the spring brake air system.

b. Air Supply System. The air supply system components are the heart of the air system. This system supplies and maintains all necessary air pressure to the various air system components.

(1) The air supply system consists of:

(a) air compressor,

(b) air governor,

(c) wet tank, also known as the quick buildup tank,

(d) safety valve,

(e) pressure protection valve,

(f) air dryer, and

(g) throttle treadle valve.

(2) Air compressor. The air compressor is mounted at the rear of the engine and is driven off the engine camshaft. A drive coupling connects the air compressor to the camshaft.

(a) The compressor is a single-stage, two-cylinder type with a displacement of 15.5 cubic feet of air at 1250 rpm.

(b) The cylinder head and block of the compressor are cooled by the engine's cooling system. Internal parts of the compressor crankcase are lubricated by the engine's lubricating system.

(c) The air compressor draws air through the engine air cleaner. An air unloader valve assembly located within the air compressor's cylinder head, works in conjunction with the externally mounted air governor.

1 When the vehicle's air pressure drops below the governor setting, the unloader will close, allowing compression within the air compressor.

2 When the air pressure reaches the governor cutoff pressure setting, the governor will signal the unloader to open. This holds open the compressor exhaust valves, allowing air to flow from one cylinder to another without compressing.

(3) Air governor. The air governor is mounted on the top, left side of the air compressor housing. It controls the output of the compressor by monitoring the air system pressure.

(a) The governor is a spring poppet type unit. The governor will signal the unloader valves at a cutoff pressure between 100 to 120 psi

pressure. The governor will allow compression when the system reaches a pressure of 65 to 70 psi.

(b) The governor may be adjusted by turning an adjuster stem. The adjuster stem controls the spring tension against the poppet.

(4) Wet tank. The wet tank is located at the front of the vehicle and serves two purposes.

(a) First, with the help of the pressure protection valve, the wet reservoir acts as a quick buildup tank.

(b) The second purpose of the wet tank is to cool heated air created by the compressor, which condenses water from the air. This separated moisture settles to the bottom of the tank. A drain cock is located at the bottom of the tank to drain the moisture that has accumulated.

(c) A safety valve is used in the event that system pressure exceeds 150 psi. The safety valve will automatically open, allowing air to escape. This prevents any damage to the air system components.

(5) Pressure protection valve. The pressure protection valve holds air pressure within the wet tank until 70 pounds of pressure is achieved, then releases the air pressure to the other air reservoir tanks. This buildup of air supplies pressure needed to operate the throttle treadle valve when the system pressure is low.

(6) Air dryer. The air dryer is a unit that automatically collects and removes moisture and contaminants from the air before they reach the wet tank. The dryer is installed in the discharge line between the compressor and the wet tank. The unit contains a cartridge filled with a desiccant and a pleated paper oil filter. An end cover assembly houses the contaminant purge valve and heater assembly. The heater and its thermostat assembly prevent freeze-up in the purge drain valve when the dryer is used in severe winter conditions. The air dryer has two operational cycles; the charge cycle and the purge cycle.

(a) In the charge cycle, air from the compressor enters the air dryer through the compressor discharge line along with water vapor and oil. The initial air flow is toward the bottom of the dryer, but air flow direction changes 180 degrees at the bottom, dropping some water and oil. Air then passes upward through the oil filter and then through the desiccant where the water vapor is removed. The dry air then passes into the purge chamber. From the purge chamber, air flows through a check valve and into the vehicle air system.

(b) In the purge cycle, when the desired air system pressure is reached, the compressor governor cuts out, unloading the compressor through line number 126, which connects the governor to the air dryer bottom cover purge valve port. This opens the exhaust of the purge valve, expelling the accumulation of contaminants from the sump. At the same time, dry air flows from the purge chamber back through the purge orifice and out the purge valve, thus stripping the water from the desiccant. The desiccant becomes activated from this cycle and is now ready for another charge cycle, which occurs when the compressor returns to the compression cycle.

(7) Throttle treadle valve. The throttle treadle valve controls the speed of the engine. It is considered part of the air supply system because it requires initial air pressure to operate.

c. Primary Service Air Brake System

(1) The primary service air brake system consists of:

(a) a primary air reservoir tank,

(b) a brake treadle valve,

(c) service and spring brake relay valves,

(d) trailer service glad hand,

(e) low air pressure and stoplight switches,

(f) air gage, and

(g) parking and trailer hand brake valves.

(2) Primary air reservoir tank. The primary air reservoir tank is located on the left side of the radiator support assembly. The purpose of the primary reservoir tank is to store enough air pressure so if the supply of constant air pressure from the air supply system should fail, the operator can still make a limited brake application.

(a) The air reservoir is equipped with a one way check valve on the inlet side. The check valve allows air pressure to flow into the primary reservoir tank but prevents the air from escaping if the supply of constant air should fail.

(b) A drain cock is provided to remove the moisture that has condensed at the bottom of the air reservoir tank.

(3) Brake treadle valve. The brake treadle valve is a suspended pedal-operated type brake valve. It is located next to the throttle treadle valve in the cab.

(a) The brake treadle valve is designed to operate through a series of valves, diaphragms, and springs that allows the operator to apply the appropriate amount of force to the brake shoes to slow or stop the vehicle.

(b) The brake treadle valve has two separate supply and delivery circuits for service and emergency braking. This provides the operator with a graduated control for applying and releasing the vehicle's brakes. If air is lost in either circuit, the other circuit will continue to function.

(4) Service and spring brake relay valves.

(a) The relay valve is located on the right rear side of the front power unit. The valve is mounted on a panel attached to the right frame rail, below the air reservoir tank.

(b) The purpose of the relay valve is to speed up the delivery and release of the compressed air to the spring brake air chambers.

(c) The service brake relay valve controls the air pressure in the service section of the spring brake air chamber. The spring brake relay valve controls the air pressure in the spring brake section of the spring brake air chamber.

(5) Trailer service glad hand. This device allows air from the towing vehicle to operate the service brake system on the towed vehicle.

(6) Check valves. There are three single check valves located within the primary system. Two of them are connected to an air manifold located under the front engine mount. The other check valve is on the supply side of the primary air reservoir tank. These valves allow air to flow in one direction but not the other.

(7) Low air pressure and stoplight switches.

(a) The low air pressure switches are located on the brake treadle valve. There are two switches, one for the primary system and one for the secondary system. When the air pressure drops below 65 psi, the switch sends an electrical signal, activating the air pressure warning buzzer.

(b) There are two stoplight switches on the brake treadle valve. These switches activate the brake lights on the trailer.

(8) Parking and trailer hand brake valves. The parking and trailer hand brake valves are supplied air from the primary system but they control the components that involve the spring air brake system.

(9) Air pressure gage.

(a) The air pressure gage is located on the front instrument panel next to the battery gage.

(b) The green arrow on the gage indicates the air pressure within the primary system.

d. Secondary Air Brake System.

(1) The secondary air brake system consists of:

(a) the three remaining air reservoir tanks,

(b) a service and spring brake relay valve,

(c) spring brake control valve,

(d) the brake treadle valve,

(e) the pressure protection valve,

(f) the air gage,

(g) quick release valve,

(h) double check valves,

(i) glad hands,

(j) trailer hand brake control valve,

(k) pressure switches, and

(l) a drive line lockup switch.

(2) Secondary air reservoir tanks.

(a) There are three air reservoir tanks within the secondary system. One is located on the right side of the radiator support assembly and the other two are attached to the frame rails of each trailer.

(b) A check valve is located on the inlet side of the front power unit air reservoir tank. Each of the three tanks contains draincocks to drain air and moisture.

(3) Service and spring brake relay valves. The relay valves that are attached to the trailer work directly off the secondary system air pressure. The two that are on the MK48 front power unit work directly off the primary system air pressure. In the event of an air pressure loss in the primary system, the secondary system air pressure would then operate these valves by way of the spring brake control valve.

(4) Spring brake control valve. The spring brake control valve is used to supply a specific limited hold-off pressure to the spring brake relay valves. In the event that air pressure is lost in the primary system, the valve will modulate air pressure to both the service and spring brake valves. This will allow the operator to have limited braking from the secondary system.

(5) Pressure protection valve. The pressure protection valve blocks off the accessory air circuit to protect system air pressure in the event of a malfunction. The accessory air circuit consists of the wipers, horn, axle lockup units, and the transfer case lockup unit.

(6) Air pressure gage. This is the same air gage that is used in the primary system. The red arrow on the gage indicates the air pressure within the secondary system.

(7) Quick release valve.

(a) The quick release valve is located at the right rear of the fan assembly.

(b) The purpose of the quick release valve is to speed up the exhaust of air from a towed vehicle while it is connected to the front glad hands.

(8) Double-check valves. There are two, double-check valves that are located on the relay valve panel on the MK48 front power unit.

(a) The purpose of the check valve is to allow the primary system to receive signal air pressure from either the brake treadle valve for a normal operation or from the brake system of a towing vehicle.

(b) The other double-check valve is also located on the relay valve panel. This check valve isolates the trailer hand brake control valve from the service control circuit to the trailer glad hands.

(9) Glad hands. There are four glad hands in the secondary system. Two of them are at the front of the vehicle and two are at the rear of the trailer. These glad hands are supplied by secondary air pressure and supply air pressure to a vehicle being towed.

(10) Trailer handbrake control valve.

(a) The trailer handbrake control valve applies the brakes for any additional trailer that is being towed behind the vehicle.

(b) The trailer handbrake is located on the side panel within the cab.

(11) Pressure switches.

(a) The pressure switches are air operated switches that monitor the operation of the lockup systems on the axles and transfer case.

(b) There are two pressure switches; one in-line with the transfer case lockup and the other in-line with the axle differential lockup.

(12) Drive line lockup switch.

(a) The drive line lockup switch directs air pressure either to the transfer case lockup or to the axle differential lockup.

(b) The lockup switch is located on the front instrument panel on the right hand side.

e. Spring Brake Air System Components. The components of the spring brake air system are also the same as those of the primary and secondary systems.

(1) The spring brake air system components consist of:

(a) the three secondary air reservoir tanks,

(b) parking brake valve,

(c) trailer handbrake valve,

(d) spring brake relay valves, and

(e) spring brake chambers.

(2) Parking brake valve.

(a) The parking brake valve is a push-pull valve that applies and releases the spring brakes.

(b) In the event of an air system malfunction, the spring brakes will not be activated until the parking brake valve is pulled out. Once the valve is pulled, the air is released in the spring brake chambers engaging the brakes.

(3) Trailer brake valve.

(a) The trailer brake valve is also a push-pull valve that directs air pressure to the trailer coupled to the MK48 and to a trailer that is being tandem towed. When the valve is pushed in, the trailer brakes are activated. When the valve is pulled out, the towing trailer is activated along with the trailer.

(b) The trailer brake valve is located right below the parking brake valve.

(4) Spring brake air chambers. The spring brake chambers are made up of two air chambers connected together. One part of the chamber uses air pressure from the spring brake relay valve to compress a spring to release the brakes used for parking. The other half of the chamber uses air pressure from the service relay valves to apply the brakes during normal operation.

2. PRINCIPLES OF OPERATION OF THE LVS COMPRESSED AIR SYSTEM

a. Supply System Operation

(1) The air compressor, which is directly driven by the engine, provides compressed air to the system. Air from the compressor first passes through the air dryer to remove oil, moisture, and foreign material before passing on to a wet tank.

(2) The wet tank supplies air pressure to the throttle treadle valve and the air governor on the compressor.

(3) Compressed air from the wet tank passes through a pressure protection valve, which opens at 70 psi, and on through check valves to the primary and secondary air reservoirs. This piping system divides the vehicle air supply into the two separate systems pressure protected from one to the other by the check valves at the inlet to each tank.

(a) The primary air reservoir tank serves the front power unit brake system. The secondary air reservoir tank, primarily serves the trailer brake system. Both systems supply the emergency brake operation.

(b) Compressed air from the secondary reservoir tank also flows through a pressure protection valve to supply the differential locking system, windshield washer and wiper, and air horn. This pressure protection valve assures that a preset pressure must be retained in the reservoir tank for the brake system operation before air pressure can flow to the accessory air circuit.

b. Service Brake Application

(1) When the brake treadle valve is depressed, air pressure is transmitted simultaneously through separate circuits to the vehicle's front and rear brake systems. The brake valve delivers a controlled air pressure signal from each circuit to their respective relay valves. The amount or degree of the air pressure is determined by the braking effort applied to the pedal.

(2) The relay valves respond to this signal by supplying air to the service sections of the No. 2 axle spring brake chambers and the service sections of the No. 3 and No. 4 rear axle spring brake chambers on the trailer.

(3) When the parking brake valve is pushed in, air is sent through the spring brake relay valve to the spring brake section of the spring brake air chambers. This air pressure compresses the spring, which releases the parking brakes.

c. Emergency Brake Application

(1) The emergency brakes are the brakes remaining on the vehicle after any single failure anywhere in the service brake system. Emergency braking is controlled by the treadle valve through the function of the spring brake control valve.

(2) The spring brake control valve constantly monitors the secondary service reservoir pressure and the primary section brake treadle valve delivery pressure. As long as the secondary service reservoir pressure is normal, the spring brake control valve is in a static mode.

(3) However, should loss of primary service reservoir pressure occur, the driver is alerted by the low pressure warning system. If the brake treadle valve is depressed, the spring brake control valve senses the secondary section delivery pressure signal from the treadle valve, and reacts by applying and releasing the brakes in direct proportion to the secondary

section pressure signal. Air pressure then exhausts or pressurizes the spring brake air chamber through the relay valve.

(4) The front brakes are applied normally from the front brake circuit, as are the trailer service brakes. This affords the driver modulated braking and the "feel" of a normal service brake stop. Releasing the brake treadle valve permits the spring cavities to recharge and retract the springs.

(5) A total air system failure will not result in application of the spring brakes automatically. The operator may bring the vehicle to a stop, using the spring brakes only, by pulling the button out on the parking brake valve.

d. Parking Brake Application

(1) The parking brakes or spring brakes are applied by pulling out the parking brake knob. This will exhaust the spring brake relay valve which in turn exhausts the air pressure from the spring brake section of the spring brake air chamber, applying the parking brakes.

(2) Release of the spring brakes is accomplished by pushing in the push-pull parking brake valve. Air is taken from the primary supply system to resupply the spring brake relay valve and the spring brake air chambers.

(3) If the parking brake is not applied and the air reservoirs are manually drained, the spring brakes will not set automatically. The parking brake knob must be pulled out to release the air from the spring brake air chambers.

3. SCOPE OF ORGANIZATIONAL MAINTENANCE RESPONSIBILITIES FOR THE LVS COMPRESSED AIR SYSTEM

a. The organizational maintenance mechanic is responsible for replacing all of the air system components except the air comprssor.

b. The organizational maintenance mechanic is also responsible for adjusting the air governor, servicing and repairing the air dryer and repairing the parking brake valve.

4. TESTING THE LVS COMPRESSED AIR BRAKE SYSTEM COMPONENTS

a. Test the Air Lines and Fittings

(1) To test the air lines and fittings, a solution of liquid soap and water will be required. This soapy solution is needed to detect any air leaks that may occur in the air lines or fittings.

(2) When you are checking the air lines for leaks, the air system must be at full system pressure; 120 psi if possible.

(3) Now, apply the soapy solution to the suspected fittings or air lines and watch for a bubble. A one inch bubble in three seconds is acceptable.

(4) Another way to test the air lines and fittings is to listen for air leaking.

b. Test the Air Compressor

(1) To test the air compressor, you first must carefully loosen and bleed the air pressure from the governor signal line number 114, at the governor. Do not completely remove the air line from the governor until all air pressure has been bled from the line. This caution holds true for any air line that you are removing.

(2) Once the air has been bled off, remove the air line.

(3) Start the engine and very slowly loosen air line number 183 at the air compressor, and listen for air escaping.

(a) If no air is heard escaping, the air compressor must be checked further. This is an intermediate maintenance responsibility and you should notify your supervisor.

(b) If air is heard escaping, the air compressor is functioning properly. Now shut down the engine.

(4) Connect and tighten signal line number 114 to the governor.

c. Test and Adjust the Governor

(1) First, drain all the air pressure from each of the five reservoir tanks.

(2) Once all the air has been drained, close the drain valves and start the engine.

(3) Now watch the air pressure gage in the cab. Both the red and green pointers should reach 100-120 pounds per square inch of pressure within ten minutes or less. You can tell when the governor cuts out because the air dryer will discharge air. If the pointers are above or below the 100-120 mark, the governor must be adjusted.

(a) To adjust the governor, first shut down the engine and drain the air reservoir. Next, close the drain valves.

(b) Now remove the governor cover and loosen the locknut on the adjusting screw.

(c) Next, start the engine and build up the air pressure, noticing when the governor cuts out. Set the pressure reading at 120 psi.

1 To increase the air pressure, turn the adjusting screw counterclockwise.

2 To decrease the air pressure, turn the adjusting screw clockwise.

(d) Once the governor is adjusted, tighten the locknut and install the governor cover.

(e) You should replace the governor if, after trying to adjust it, the air pressure reading does not change.

d. Test the Air Dryer

(1) Once again the air system must be drained before starting the test.

(2) After all the air has been drained, remove air line number 184 from the air dryer discharge port.

(3) Start the engine.

(a) If a large amount of air comes from the discharge port, the air dryer is functioning properly.

(b) If little or no air comes from the air dryer discharge port, the next step is to remove the discharge port check valve.

(4) To remove the check valve, you first must shut down the engine. Now remove the check valve from the air dryer.

(5) After the check valve is removed, start the engine and check for air flow from the discharge port.

(a) If little or no air comes from the discharge port after the check valve has been removed, the air dryer must be serviced.

(b) If the air flow is greater than it was when the check valve was not removed, the check valve is defective and must be replaced.

e. Test the Pressure Protection Valve

(1) Drain the air from the wet tank. You do not need to drain the complete air system because of the check valves that are located in the main reservoir tanks.

(2) Once the wet tank is drained, disconnect air line number 003 from the pressure protection valve.

(3) Now, remove the pressure protection valve and install a tee fitting into the wet tank.

(4) Install the pressure valve at the other end of the tee and connect a pressure gage to the remaining connection on the tee.

(5) Start the engine and wait for the pressure protection valve to discharge.

(a) If the air does not discharge or discharges early when the air pressure gage reads between 60 and 80 pounds per square inch, replace the valve.

(b) If the air discharges before the air pressure gage reads 70 psi $\pm$ 10, replace the pressure protection valve.

(c) If the air discharges between 60 and 80 psi, the pressure protection valve is operating properly.

(6) After testing the valve remove all the test equipment and reconnect the valve and air line back into the wet tank.

f. Test the Safety Valve. This test can be used to quickly check the safety valve but it will not tell you if it is releasing at the proper pressure. The safety valve should discharge the air when the air system pressure reaches 150 psi. This test will only tell you if the safety valve is capable of releasing and holding air pressure.

(1) To test the safety valve, you must have system air pressure.

(2) Now pull the valve stem of the safety valve out. Air should come out.

(3) If air comes out, release the valve stem and the air pressure should stop.

(4) If the air does not stop or if the air does not come out, the valve must be replaced.

g. Test the Brake Treadle Valve

(1) Remove the stop light switch from the left side of the brake treadle valve. What circuit is not functioning properly determines which switch to remove. The top switch is for the No. 1 and No. 2 axles and the bottom switch is for the No. 3 and 4 axles.

(2) Install an air gage in the open stop light switch port.

(3) Check to make sure you have system pressure. Assuming that you have system pressure, apply the brake. The pressure reading will be proportional with the movement of the brake pedal.

(a) If the air gage registers between 40-100 psi, the brake treadle valve is functioning properly.

(b) If the air gage registers below 40 psi, replace the brake treadle valve.

(4) With the treadle pedal fully applied, release the pedal and the air gage should promptly fall off to zero.

h. Test the Relay Valves. This test can be used for any of the relay valves.

(1) First, remove the relay valve discharge line going to the non-working spring brake chamber. Install a test gage between the discharge port and the air line going to the spring brake chamber.

(2) Make sure you have system air pressure and then apply the brakes.

(a) If you have system air pressure at the discharge ports, the circuit for the discharge port is operating properly.

(b) If the air pressure reading is below system pressure or nonexistent, the next step is to check the supply of air to the relay valve.

(3) Remove the test air gage from the discharge port and install the air test gage in line with the supply line port. The supply line will be the

air line coming from the air reservoir tanks, so before the supply line is removed, drain the air tanks.

(a) Start the engine and build up the air pressure. The test air gage should increase at the same rate as the air gage in the cab.

(b) If no reading or a different reading is found, the trouble is not with the relay valve but is located some place in the air line or reservoir tank.

(4) If there is correct air pressure at the supply port, move the test air gage to the air line at the control port. The control port is where the air signal is received from the brake treadle valve.

(5) Once the test air gage is in line, apply the brake treadle valve.

(a) You should get system air pressure at the gage with the brake pedal fully depressed.

(b) If you do not get a reading, the circuit going to the relay valve must be checked.

(6) After testing all of the ports of the relay valve and finding air pressure to the supply and control ports but not at the discharge port, the relay valve must be replaced.

i. Test the Air Brake Chamber. The first portion of this test can be performed on either the spring brake chamber or the wedge brake chamber.

(1) During these testing procedures always drain all the air pressure from the system. Also make sure that the wheels are blocked to prevent the vehicle from rolling.

(2) Now remove the service brake line from the non-working air chamber and install a test air gage in line with the air line and the chamber.

(3) Start the engine and build up the system air pressure.

(4) Once you have system air pressure, note the reading on the gage.

(a) If the reading is not 40-100 psi, the problem is within the circuit.

(b) If the reading is between 40 and 100 psi and the brakes do not apply, the mechanical components of the brake chamber must be checked.

1 On the wedge brake chambers, there are no further tests to perform. The chamber components must be visually inspected.

2 On the spring brake chambers, a further test can be performed to determine if the problem is with the air chamber on the S-cam linkage.

a First drain the air system and reconnect the air line to the air chamber.

b Now remove the clevis pin from the clevis.

c Start the engine and build up the air pressure. Apply the brake treadle valve and note the reaction of the air chamber.

d If the clevis extends, then there is something at fault with the mechanical linkage. If the clevis does not extend, then the spring brake chamber must be replaced.

(5) When testing the parking brake portion of the spring brake chamber, there are two problems that can occur. One problem is the parking brakes do not apply and the other is they apply but do not release.

(a) If the brakes do not apply, pull the parking brake valve out and slowly loosen the air line at the spring section of the non-working air chamber.

1 If the parking brake applies, then there is something at fault with the circuit to the air chambers.

2 If the parking brake does not apply, follow the procedures that will determine if it is the mechanical linkage or the air chamber.

(b) If the parking brakes applied but did not release, the following testing procedures should be followed.

1 First pull out the parking brake valve to apply the brakes.

2 Now remove the air line that supplies air to the spring brake portion of the air chamber. Install the test air gage in line with the air line air chamber.

3 Start the engine and push in the parking brake valve. The reading on the test gage should be 65 psi or higher.

a If the reading is 65 psi or higher but the brakes still do not release, then the mechanical linkage must be checked.

b If the reading is below 65 psi, then there is something at fault in the brake chamber circuit.

TRANSITION: Now we will cover the repair of two of the air system components. We will not cover all of the replacement procedures that are authorized by organizational maintenance. Those procedures can be found in your technical manual. First, we will repair the parking brake valve.

5. REPAIR THE COMPONENTS OF THE LVS COMPRESSED AIR BRAKE SYSTEM

a. Repair the Parking Brake Valve.

(1) Before you remove the parking brake valve, you should disconnect the batteries and drain the air system.

(2) Now you can remove the instrument panel from the dash and lean it up against the steering wheel. This will allow for easier access to the valve.

(3) Remove the roll pin, knob, and locknut and push the valve through the dash.

(4) Next, reach under the dash and pull the valve clear so that the air lines can be removed.

(5) Tag each air line and then remove them.

(6) After the valve is removed, mark the position of all the fittings for proper installation. Now remove the fittings and tee.

(7) To disassemble the valve, remove the screws and pull the end cap off. Pull the O-ring out and discard it. Never reuse O-rings.

(8) Secure the stem and remove the locknut, washer and poppet. Push the stem through the body and remove the other O-ring. The valve is now completely disassembled.

(9) Inspect all the parts for any damage or wear and replace them as necessary.

(10) To reassemble the parking brake valve, install a new O-ring onto the stem. Slide the stem into the body and install the poppet washer, and locknut. Tighten the locknut securely.

(11) Next, install a new O-ring onto the body and position the end cap over it. Secure the end cap with the screws.

(12) Before you install the fittings and tee, coat the threads of each one with pipe sealant. Now install them in their marked location.

(13) Install the air lines in their tagged location and position the valve into the dash. Secure the valve to the dash with the locknut. Also install the knob and roll pin back onto the stem.

(14) After the valve is installed, secure the instrument panel back onto the dash and connect the batteries.

(15) The last step is to fully charge the air system and check the parking brake valve for leaks and proper operation.

b. Repair the Air Dryer. Before removing the air dryer, drain the air system.

(1) Removal of the air dryer.

(a) Tag and remove the three air lines.

(b) Now, remove the capscrews holding the air dryer to the bracket, but do not remove the air dryer.

(c) Before the air dryer can be completely removed, you have to lift it a little and remove the wire from the bottom terminal. Once the wire is removed, lift the air dryer off the bracket and remove it from the vehicle.

(2) Disassemble the air dryer.

(a) Before beginning to disassemble the air dryer, you must first mark the position of the fittings and brackets for proper installation. Now remove all the fittings and brackets.

(b) Next, remove the safety valve and check valve. The check valve may be disassembled if it was found to be unserviceable.

1 To disassemble the check valve, place it into a soft-jawed vise.

2 Now, remove the valve body, O-ring, sealing washer, spring guide, and spring.

3 Remove the end cap from the vise and tip it over to remove the check ball.

(c) Now go back to the air dryer and remove the end cover. To do this you must remove the three capscrews, washers, and locks. Match mark the end cover and shell before removing it.

(d) Then push the end cover into the air dryer shell and remove the retaining ring. Now pull the end cover and O-ring from the air dryer shell and discard the O-ring.

(e) If the end cover was found unserviceable, it can be disassembled for repairs.

1 The first step in disassembling the end cover is to remove the exhaust plate and inspect the diaphragm. If the diaphragm is unserviceable, remove and discard it.

2 Now, remove the purge valve from the end cover. Hold the piston and remove the screw, lockwasher and valve connected to it. Remove the piston, spring and the O-rings. Discard all the O-rings.

(f) The last item to remove from the end cover is the thermostat. Remove the four screws from the cover and pull the cover off and remove the gasket. If the thermostat is defective, remove the nut, washer and O-ring and pull the thermostat out of the cover.

(g) The last component to remove is the desiccant cartridge. To do this, simply turn the capscrew counterclockwise and pull the cartridge from the air dryer shell. If the desiccant was determined to be unserviceable, then the cartridge must be disassembled.

1 To disassemble the cartridge, remove the nut and the warning tag that is attached to the capscrew. That warning tag should always stay with the air dryer.

2 After the nut has been removed, pull the seal plate, spring retainer, and spring from the cartridge. Also, remove and discard the two O-rings on the seal plate.

3 Remove the check ball from the seal plate and inspect it for damage or wear. If the ball is unserviceable, replace it.

4 Now, remove and discard the outer screen, desiccant material, and inner screen.

5 The last step is to remove the capscrew and oil separator from the cartridge.

(h) If the plug on the shell is damaged, replace it.

(3) Assemble the air dryer assembly.

(a) First we will assemble the desiccant cartridge.

1 The first step is to install two new O-rings on the seal plate.

2 Now, slide the oil separator onto the capscrew so the gasket will face the desiccant cartridge. Slide the cartridge over the capscrew and onto the oil separator.

3 Hold the cartridge upright and install a new inner screen, with cloth side up, into the cartridge. Next pour all of the new desiccant material into the cartridge.

4 Now, install the outer screen, with the cloth side down, into the cartridge. Be sure the outer screen seats over the shoulder on the capscrews.

5 Install the spring and spring retainer on the capscrew. Place the seal plate onto the capscrew. Install the warning tag and nut but only tighten the nut until the spring is compressed to half its free height.

6 With a soft faced hammer, tap the desiccant cartridge to settle the desiccant. After the desiccant is settled, tighten the nut securely.

(b) After the cartridge is assembled, install it into the air dryer shell and tighten the capscrew securely.

(c) The next subassembly to assemble is the end cover.

1 First, install a new O-ring onto the purge valve piston and slide the piston and spring into the purge valve. Hold the piston and the valve washer and screw and tighten the screws securely.

2 If the diaphragm was unserviceable, install a new one and then attach the exhaust plate to the purge valve.

3 Next, install the thermostat and cover to the end cap.

4 The last step is to apply pipe sealant to the reducer and elbow threads and install them onto the end cover.

(d) Now, install a new O-ring onto the end cover and slide the end cover into the shell, making sure the alinement marks are alined.

(e) Push the end cover in and install the retaining ring and the three locks, lockwashers and capscrews.

(f) The last subassembly to assemble is the check valve. First, place the check valve into a soft-jawed vise. Now coat the spring guide, valve body, O-ring , check ball, spring, and new seal ring washer with lubricating oil and install them into the check valve.

(g) Install the brackets, fittings, safety valve, and check valve into their marked location. Make sure that pipe sealant is applied to the threads.

(4) Install the air dryer assembly.

(a) Position the air dryer over the mounting bracket and install the wire to the bottom terminal. Slide the boot over the terminal, once the wire is connected.

(b) Install the mounting capscrews to the bracket and tighten them securely.

(c) Connect the air lines in their tagged location and check for any air leaks.

6. DIAGNOSING THE MALFUNCTIONS IN THE LVS COMPRESSED AIR BRAKE SYSTEM

a. Up to this point we have covered how to test the individual components. During the troubleshooting portion of this lesson, what I will do is call on a volunteer to list the steps he/she would take to isolate a particular malfunction.

b. The transparency that you see on the screen lists the malfunctions that may occur in the compressed air systems. What I want you to do now is to take a few minutes and get familiar with the different malfunctions.

c. Malfunction No. 1 (Air dryer is constantly cycling or purging)

(1) Check the air system for leaking or damaged air lines, fittings, valves, air tanks, or air chambers.

(a) If leaks or damage are found, repair or replace as needed.

(b) If no leaks or damage are found, check the system air pressure.

(2) Check the system air pressure for too high or too low a reading on the air pressure gage.

(a) If the reading is not 100-120 psi, adjust the air governor.

(b) If the reading is 100-120 psi, check the purge valve in the air dryer.

(3) Check for a leaking purge valve in the air dryer. If leaking, repair or replace the purge valve as needed.

d. Malfunction No. 2 (Service brakes will not release or release slowly)

(1) Check the air pressure gage for 100-120 psi.

(a) If 100-120 psi are not present, go the malfunction, "No Air Pressure or Slow Buildup."

(b) If only one indicator on the dash gage reads 100-120 psi, go to the malfunction, "Air Pressure Gage Indicators Do Not Read the Same."

(c) If 100-120 psi are present on both indicators of the dash gage, check for air leaks or damage.

(2) Check the air lines, brake chambers, relay valves, and treadle valve for leaks or damage.

(a) If leaking or damaged, repair or replace as needed.

(b) If no leaks or damages are found, check the air chambers.

(3) Release the parking brake, and then check that all air chambers retract completely. The clevis locknut should be even with the mounting bracket.

(a) If any air chamber does not retract completely, go to the malfunction, "Air Pressure Gage Indicators Do Not Read the Same."

(b) If all air chambers retract completely, go to the service port of the suspected air chambers.

(4) Check the brake adjustment at all four axles.

(a) If the brakes are not properly adjusted, adjust the brakes.

(b) If the brakes are properly adjusted, check the air brake chambers.

(5) Apply and release the service brakes. Remove air line number 623 for axle number 2 or airline number 660 for axles 3 or 4 at the control valve of the suspected relay valve.

(a) If air flow is present at the suspected line, replace the treadle valve.

(b) If air flow is not present, reconnect the air lines and check the air brake chambers.

(6) Apply and release the service brakes. Remove the air line from the service port of the suspected air chamber.

(a) If air escapes, replace the relay valve.

(b) If no air escapes, check the mechanical brake components.

(7) Remove the brake drum and check the S-cams or wedges for binding. Check the brake shoe return springs for proper operation.

(a) If any of the above problems are found, repair the brake components.

e. We have just covered two malfunctions within the compressed air system. The remaining malfunctions are diagnosed by using the procedures that are outlined in the technical manual for the particular symptom that you have.

REFERENCE:

TM 2320-20/12A